Appendix B
Best Management Practices

INTRODUCTION

Best Management Practices are the primary mechanism to enable the achievement of water quality standards (Environmental Protection Agency 1987). This Appendix B describes the Forest Service's BMP process in detail; 2) lists the key Soil and Water Conservation Practices (SWCP) that have been selected to be used in the Gallatin; and 3) describes each SWCP that will be refined for site-specific conditions in order to arrive at the project level BMPs that protect beneficial uses and meet water quality objectives.

Best management practices include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. They can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (40 CFR 130.2, EPA Water Quality Standards Regulation). Usually BMPs are applied as a system of practices rather than a single practice. They are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

The Gallatin National Forest Plan states that "Soil and water conservation practices as outlined in the Soil and Water Conservation Practices Handbook (FSH 2509.22, May 1988) will be incorporated into all land use and project plans as a principal mechanism for controlling non-point pollution sources; meeting soil and water quality goals; and to protect beneficial uses. Activities found not in compliance with the soil and water conservation practices or State standards will be brought into compliance, modified, or stopped." (GNF FP, p. II-23). Montana State Water Quality Standards require the use of Reasonable Land, Soil, and Water Conservation Practices (analogous to BMPs) as the controlling mechanism for non-point pollution. Use of BMPs is also required in the MOU between the Forest Service and the State of Montana as part of our responsibility as the Designated Water Quality Management Agency on National Forest System (NFS) lands.

The Practices described herein are tiered to the practices in FSH 2509.22. They were developed as part of the NEPA process, with interdisciplinary involvement, and meet Forest and State water quality objectives.

BMP IMPLEMENTATION PROCESS

In cooperation with the State, the USDA Forest Service's primary strategy for the control of non-point sources is based on the implementation of preventive practices (BMPs) determined necessary for the protection of the identified beneficial uses.

The Forest Service Non-point Source Management System consists of:

1. BMP selection and design based on site-specific conditions; technical, economic and institutional feasibility; and the designated beneficial uses of the streams.

2. BMP Application.

3. BMP monitoring to ensure that they are being implemented and are effective in protecting designated beneficial uses.

4. Evaluation of BMP monitoring results.

5. Feeding back the results into current/future activities and BMP design.

The District Ranger is responsible for ensuring that this BMP feedback loop is implemented on all projects.

A) *Best Management Practice Selection and Design.* Water quality goals are identified in Forest Plans. These goals meet or exceed applicable legal requirements, including State water quality regulations, the Clean Water Act, and the National Forest Management Act. Environmental assessments for projects are tiered to Forest Plans, using the NEPA process. Appropriate BMPs are selected for each project by an interdisciplinary team.

BMP selection and design are dictated by water quality objectives, soils, topography, geology, vegetation, and climate. Environmental impacts and water quality protection options are evaluated and alternative mixes of practices are considered. A final collection of practices is selected that not only protect water quality but meet other resource needs. These final selected practices constitute the BMPs.

B) *BMP Application.* The BMPs are translated into contract clauses, special use permit requirements, project plan specifications, and so forth.

This ensures that the operator or person responsible for applying the BMP actually is required to apply it. The site-specific BMP prescriptions are taken from plan-to-ground by a combination of project layout and resource specialists (hydrology, fisheries, soil, geology, etc.). This is when final adjustments to fit the BMP prescriptions to the site are made before implementing the resource activity.

C) *BMP Monitoring.* During project activities (ex., timber harvest or road construction), timber sale administrators, engineering representatives, resource specialists, and others ensure that the BMPs are implemented according to plan. BMP implementation monitoring is done before, during, and after resource activity implementation. This monitoring answers the question: Did we do what we said we were going to do? Once BMPs have been implemented, further monitoring is done to evaluate if BMPs are effective in meeting management objectives and protecting beneficial uses of water. State water quality standards, including the beneficial uses, will serve as one evaluation of the criteria for the Shields River Road Project EA.

D) *BMP Monitoring Evaluation.* The technical evaluation/monitoring described above will determine how effectively BMPs protect and/or improve water quality. Water quality standards and conditions of the beneficial uses of water will serve as one evaluation criteria. If the evaluation indicates that water quality standards are not being
met and/or beneficial uses are not being protected, corrective action will consider the following three components:

1. The BMP: Is it technically sound, properly designed, and effective? Is it really best, or is there a better practice, which is technically sound and feasible to implement?

2. The implementation program or processes: Was the BMP applied entirely as designed? Was it only partially implemented? Was it properly designed? Were personnel, equipment, funds, or experience lacking with a result of inadequate or incomplete implementation?

3. The water quality criteria: Do the parameters and criteria used for effects evaluation adequately reflect human induced changes to water quality and beneficial uses?

E) *Feedback.* Feedback of the results of BMP evaluation is both short- and long-term in nature. Where corrective action is needed, immediate response will be undertaken. This action may include: modification of the BMP, modification of the activity, or ceasing the activity. Cumulative

effects over the long-term may also lead to the need for possible corrective actions.

FORMAT OF THE BMPS

Each Soil and Water Conservation Practice (SWCP) is described as follows:

Title: Includes the sequential number of the SWCP and a brief title.

Objective: Describes the SWCP objective(s) and the desired results for protecting water quality.

Effectiveness: Provides a qualitative assessment of expected effectiveness that the applied measure will have on preventing or reducing impacts on water quality. The SWCP effectiveness rating is based on literature & research, administrative studies, and professional experience. The SWCP is rated either High, Moderate, or Low based on the following criteria:

1. Literature/Research (must be applicable to area)
2. Administrative studies (local or within similar ecosystem)
3. Experience (judgment of an expert by education and/or experience)
4. Fact (obvious by reasoned [logical] response)

Implementation: This section identifies: 1) the range of site-specific water quality protection measures to be implemented and 2) how the practices are expected to be applied.

ITEMS COMMON TO ALL SOIL AND WATER CONSERVATION PRACTICES

Responsibility for Implementation: The Livingston District Ranger is responsible for insuring that the factors identified in the following SWCPs are incorporated into the road reconstruction contract. Unless otherwise specified, the Forest Engineer is responsible for insuring that the factors identified in the following SWCPs are incorporated into the construction contract and the Contracting Officers Representative is responsible for insuring that the provisions are properly administered on the ground.

Monitoring: Unless otherwise noted, SWCPs will be monitored as part of BMP Implementation Monitoring of road construction activities, and by the COR of public works road construction work.

ABBREVIATIONS

GNF = Gallatin National Forest
RC = Road Contract
COR = Contracting Officer Representative

PRACTICE 11.01 - Determination of Cumulative Watershed Effects

OBJECTIVE: To insure that impacts from individual actions do not cause cumulative effects in the larger area.

EFFECTIVENESS: Not applicable for this SWCP.

IMPLEMENTATION: A watershed cumulative effects analysis was completed as part of the Shields River Road EA (11/2003). The existing analysis accounted for all existing roads and harvest activities in the Shields River drainage above Smith Creek. . The R1R4 sediment yield model was the basis for this analysis.

PRACTICE 11.05 - Wetlands Analysis and Evaluation

OBJECTIVE: To maintain wetland functions and comply with Clean Water Act requirements for wetland mitigation.

EFFECTIVENESS: High

IMPLEMENTATION: Wetland evaluations were done by USFS and COE (Helena) personnel during the project planning and design phase. Approximately 0.086 acres of Palustrine Forested Wetland and 0.383 acres if Palustrine Shrub wetland or a total of 0.469 acres would be impacted by road fill, all within the existing Shields road right-of-way. The Palustrine Shrub wetlands are Corps of Engineers jurisdictional wetlands since they are directed connected to Riverine wetlands along Meadow Creek. The COE requires a 1.5 to 1 wetland replacement for the wetland mitigation which is 0.58 acres on National Forest lands in the Shields River watershed. The wetland mitigation will be accomplished during project implementation.

PRACTICE 13.04 - Revegetation of Surface Disturbed Areas

OBJECTIVE: To protect soil productivity and water quality by minimizing soil erosion.

EFFECTIVENESS: Moderate

IMPLEMENTATION: All disturbances outside of the main road template associated with the Shields road reconstruction will be seeded using native species following use. Seed mixes and fertilizer specifications will be incorporated into the RC.

PRACTICE 15.02 - General Guidelines for the Location and Design of Roads

OBJECTIVE: To locate and design roads with minimal soil and water resource impact while considering all design criteria.

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following items, listed and mentioned under several other Practices, nevertheless are general road location and design guidelines for minimizing impacts on water quality (FSH 7709.55, 56; Montana State BMP's):

1. Resource Specialist Review - Review available information and consult with specialists as necessary to help identify problem soil types and unstable areas, if any, and to assist with location and design.

2. Fit the road to the topography - Use natural benches, follow contours, avoid long, steep road grades. Balance cut/fill where possible to avoid waste areas.

3. Locate on stable topography - Avoid slumps and slide-prone areas, and steep sidehills.

4. Location with respect to ephemeral draws and water bodies, including wetlands - Locate roads a safe distance away from streams and other water bodies, and provide an adequate buffer zone to trap sediment before in enters into any water body. Where possible, locate turnouts and turn-around at least 200 feet from water bodies or riparian zones. Where placement within 200 feet is necessary due to safety considerations, emphasize erosion control measures to protect water quality; i.e. additional windrowing, seeding, etc.

5. Draw crossing sites - Minimize the number of stream crossings, and choose stable sites. Structures will be designed (sized) for long-term stability, generally for the Q50 (50- year return interval event), and will provide for fish passage if present. An FG-124 or 310 filing with the Montana Department of Fish, Wildlife, and Parks and Soil Conservation District is required for any crossings of perennial streams.

6. Road drainage - Locate and design roads and trails to drain naturally by appropriate use of out-sloping and in-sloping with cross drainage and grade changes, where possible. Cross drains will be installed to 1) carry intercepted flow across constructed areas; 2) to relieve the length of un-drained ditch; and 3) to minimize disruption of normal drainage patterns. Road and trail drainage should be channeled to effective buffer areas, either natural or manmade, to maximize sediment deposition prior to entry into live water.

In addition, roads and trails will be designed to minimize impacts on water quality. Design criteria to accomplish this will include:

a. Ditch lines and road grades will be designed to minimize unfiltered flow into ephemeral draws. A rolling dip, relief culvert or similar structure will be installed as close as practical to crossing to minimize direct sediment and/or water input directly into draws. Route the drainage through buffer strips, or other sediment settling structures where possible. All ditches fill during Shields River road widening will be be constructed to original capacity.

b. At a minimum, windrows (Practice 15.10) will be installed 100 feet on both sides of crossings, and where installation will minimize sediment delivery to nearby streams or channels. Windrows will also be installed where fill slope erosion is possible, or where road derived erosion may be delivered; i.e. outflow area of culverts or rolling dips, etc (Std. FS Spec. Section 201, Clearing and Grubbing; 05- Slash Treatment).

c. The design objective of cross drainage and ditch relief culverts will be to restore intercepted flow to the natural drainage path and direction as rapidly as possible. A deliberate attempt will be made to keep the road from becoming the concentration mechanism.

7. Design standards- Design to the minimum standard necessary to accomplish anticipated use and equipment needs safely, balancing long-term and short-term maintenance needs.

8. Stabilization of erodible cut and fill surfaces through re-vegetation- Aggressive seeding and fertilization of erodible surfaces exposed during construction will be accomplished. Out-year seeding and fertilization will be done where original treatment is not fully successful.

PRACTICE 15.03 - Road Erosion Control Plan

OBJECTIVE: To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction and

maintenance activities through effective contract administration during construction and timely implementation of erosion control practices.

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following erosion control objectives and mitigation measures have been developed by the IDT and will be reflected in contract specifications and provisions. The Engineer will certify that the Contractors Erosion Control Plan meets the specifications of Std. FS Spec. Section 204:

1. Vegetation will be re-established as soon as possible on exposed cut and fill slopes. Various operating seasons on units the sale area will require seeding and fertilization specs to vary. Mulching will be required on erodible slopes where difficulty in re-establishing vegetation is anticipated.

2. Prompt attention to potential erosion problems, both anticipated and un-anticipated, before they become a water quality issue, will be required. On-site stock piling of straw bales for immediate availability and erosion cloth or a suitable substitute stored off-site but available will also be required.

3. Windrows will be used on all significant fill slopes where there is a possibility of erosion or sedimentation into a nearby stream or channel (Std. FS Spec. 201).

4. Cross drains and relief culverts will be installed so as to minimize effects from the intercepted water (see also Practice 15.02 f.(3)).

5. Equipment shall not be operated when ground conditions are such that excessive ground impacts will occur unless these impacts are documented and mitigated through other Conservation Practices.

PRACTICE 15.04 – Timing of Construction Activities

OBJECTIVE: To minimize erosion by conducting operations during minimal runoff periods.

EFFECTIVENESS: High

IMPLEMENTATION: The following erosion control objectives and mitigation measures have been developed by the IDT and will be reflected in contract specifications and provisions. The Engineer will certify that the Contractors Erosion Control Plan meets the specifications of Std. FS Spec. Section 204:

1) Operations will be scheduled during periods when the probabilities for rain and runoff are low.

2) Equipment shall not be operated when ground conditions are such that excessive impacts on soil and water quality will result.

3) Utilize temporary erosion control measures to prevent, control and mitigate erosion and sedimentation.

PRACTICE 15.05 - Slope Stabilization and Prevention of Mass Failures

OBJECTIVE: To reduce sedimentation by minimizing the chances for road-related mass failures, including landslides and embankment slumps.

EFFECTIVENESS: Moderate

IMPLEMENTATION: In areas with intrinsic slope stability problems, appropriate technical resource staffs (Geotechnical Engineers, Soil Scientists, Geologists) will be involved in an interdisciplinary approach to route location and design to meet requirements developed through the NEPA process. No areas of slope stabilization or mass wasting problems are anticipated in the Shields Road project.

PRACTICE 15.06 - Mitigation of Surface Erosion and Stabilization of Slopes.

OBJECTIVE: To minimize soil erosion from road cut slopes, fill slopes, and travel way.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Areas requiring mitigation of surface erosion will occur during the life of the contracts. When these are found, the following provisions will be implemented:

1. Where surface erosion is occurring because of inadequate vegetative cover, additional seeding and fertilization will occur using recommended seed and fertilizer mixes. A T108 spec covers reseeding of cut slopes, if bared by the
road contractor

2. Where ditches are carrying erosion products into ephemeral draws, rock check dams, straw bale, erosion cloth ditch blocks, or other economical structures will be installed to "short-circuit" the delivery.

3. Where straw bale/erosion cloth structures either fail or opportunity for success is doubtful, additional relief culverts will be installed to drain the ditches out onto suitable ground to at least minimize delivery of erosion products to the draw.

4. Slumping of cutslopes may require a combination of both mechanical and vegetative controls. If/when this problem is found, a solution will be determined in consultation with a geotechnical engineer to change the design. No cutslope slumping is anticipated in the Shields Road Project.

PRACTICE 15.07 - Control of Permanent Road Drainage

OBJECTIVE: To minimize the erosive effects of concentrated water and the degradation of water quality by proper design and construction of road drainage systems and drainage control structures.

EFFECTIVENESS: Moderate

IMPLEMENTATION:

A. For construction the following criteria will be incorporated into new road design:

1. Provide adequate drainage from the surface of all permanent and temporary roads through use of sloping, dips, grade changes, etc.

2. Ditch relief culverts will be designed to handle anticipated ditch flow.

3. Provide energy dissipaters or downspouts where necessary at the downstream end of ditch relief culverts to reduce erosion energy of the emerging water.

B. For Reconstruction

At a minimum, the following items will be added to or improved in the existing road system that will be used for proposed timber haul:

1. Rock energy dissipators or downspouts will be placed below problem culvert outlets where feasible (Reconstruction Item). Refer to FS Std. Spc. 204 and 206A.

2. In all areas where ditch erosion is significant at this time, relief culverts that drain onto suitable areas will be installed where feasible (Reconstruction Item).

3. Roads restricted after use will also have erosion control measures in place prior to final pull-out. (TSC B/C 6.6, B6.65)

4. For all native surface roads to be closed, the travel-way will be scarified, seeded and fertilized. (TSC C6.601, FS Std. Spc 299).

5. All ditches fill on private land will be restored to original capacity.

PRACTICE 15.10 - Control of Road Construction Excavation and Side-cast Material

OBJECTIVE: To reduce sedimentation from unconsolidated excavated and side-cast material caused by road construction, reconstruction, or maintenance, through the use of slash filter windrowing (FS Std. Spc. 301.05, 203, or 299.03).

EFFECTIVENESS: High

IMPLEMENTATION: . Windrows, straw bales, or silt fences will be installed wherever erosion may deliver sediment to a stream system.

PRACTICE 15.11 - Servicing and Refueling of Equipment

OBJECTIVE: To prevent contamination of waters from accidental spills of fuels, lubricants, bitumens, raw sewage, wash water, and other harmful materials.

EFFECTIVENESS: High

IMPLEMENTATION: The Contracting Officer, Engineer, or designated Administrator will designate the location, size and allowable uses of service and refueling areas. They will also be aware of actions to be taken in case of a hazardous spill, as outlined in the Forest Hazardous Substance Spill Contingency Plan. (in timber sale BT6.34; CT6.341 for oil and oil products). Equipment servicing/fueling is not allowed within 100' of surface water. All petroleum products will be stored in leak proof containers. Petroleum waster products will be removed from the site at least weekly. These provisions will be included in the Shields River road contract (RC).

PRACTICE 15.13 - Controlling In-Channel Excavation

OBJECTIVE: To minimize stream channel disturbances and related sediment production, and to make sure activities comply with the FG-124

Process as agreed upon between the Forest Service and the State of Montana.

EFFECTIVENESS: High

IMPLEMENTATION: Construction equipment may cross, operate in, or operate near stream-courses only where so designated by the Forest Service or as necessary in the construction or removal of culverts and bridges. This will be done in compliance with the specifications and mitigation required in the FG-124 or 310 permit and included in the project specifications. The FG-124 or 310 Form will be sent to MDFWP, Soil Conservation District, approved or modified, and returned prior to actual channel work.

Unless otherwise approved, no in-channel excavation shall be made outside of de-watered areas, and the natural streambed adjacent to the structure shall not be disturbed without approval of the Engineer. If any excavation or dredging is made at the site of the structure before caissons, cribs, or cofferdams are sunk in place, all such excavations will be restored to the original ground surface or the stream ed will be protected with suitable stable material. Material from foundation or other excavation shall not be discharged directly into live streams but shall be pumped to settling areas shown on the drawings or approved by the Engineer. If the channel is damaged during construction, it should be restored as nearly as possible to its original configuration without causing additional damage to the channel. Excavations for stream crossings will conform to FG-124 criteria, including timing restrictions. (as well as Std. FS Spec 206, 206A, and applicable SPS's).

PRACTICES: 15.17 – Regulation of borrow pits, Gravel Sources and Quarries

OBJECTIVE: To minimize sediment production from borrow pits, gravel sources, and quarries, limit channel disturbance in those gravel sources suitable for development in floodplains.

EFFECTIVENESS: High

IMPLEMENTATION: Project feasibility, location, suitability, and the limits for disturbance and sediment production will be identified by an interdisciplinary team which will consider the following:

1) Remove and stockpile the top soil for its re-use during reclamation phase.

2) Implement appropriate drainage designs during and following pit excavations to control temporary erosion until the area is rehabilitated.

3) Upon completion, re-slope the pit area and stabilize the soil by seeding, mulching, and planting.

4) Avoid floodplains during project design.

PRACTICE 15.21 - Maintenance of Roads

OBJECTIVE: To maintain all roads in a manner which provides for soil and water resource protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities.

EFFECTIVENESS: Moderate

IMPLEMENTATION: For roads not in an active timber sale area road maintenance must still occur at sufficient frequency to protect the investment in the road as well prevent deterioration of the drainage structure function. This will be accomplished by scheduling periodic inspection and maintenance, including cleaning dips and cross drains, repairing ditches, marking culvert inlets to aid in location, and cleaning debris from ditches and culvert inlets to provide full function during peak runoff events (FSH 7709.15).

PRACTICE: 15.22 – Road Surface Treatment to Prevent Loss of Materials

OBJECTIVE: To minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Project location and detailed mitigation measures are developed by an interdisciplinary approach to meet environmental analysis criteria. Forest Service supervisors are responsible for insuring that In-service projects meet design standards and management requirements. On contracted projects, compliance with contract specifications, and operating plans is assured by the Contracting Officer or Engineering Representative.

Road surfacing treatments such as dust abatement may be required during road improvement activities. Initiation of surface treatments will be determined by the Contracting Officer or Engineering Representative.

Soil Protection Guidelines For Gravel Pit Development in the Lower Shields River Drainage (a weed-prone area)
Gallatin National Forest
02-20-04

These guidelines are designed to preserve stockpiled topsoil, prevent erosion, and to prevent weed invasion during and after gravel pit use. The environment is relatively warm and dry with common shrubs and grasses. Weeds occur in the area and are relatively likely to invade any disturbed surfaces.

Topsoil should be preserved for all excavations during construction. This would include the top 12 inches of the soil profile. It should be segregated in a pile near the site. If the gravel pit is to be open for more than one year, the pile of soil should be seeded with native grass species to prevent weed growth. Stockpile maximum slope should be less than 20% to prevent erosion.

If the pit is to be open for more than one year, chemical weed treatment should be used to prevent weed spreading on the topsoil pile and in the open pit itself.

Upon closing of the pit, slopes should be regraded to less than 20%. The stockpiled topsoil should be re-spread to a depth of 8-10 inches. The soil surface should be harrowed, and seeded with appropriate native grass and shrub species by incorporating seed in the top inch of the soil surface, fertilizing to an appropriate degree.

All access roads should be reclaimed when the gravel pit is closed. If the road surface was excavated, re-spreading topsoil saved from construction is needed. The topsoil surface should be harrowed to at least 6 inches in depth, and seeded with appropriate native grass and shrub species by incorporating seed in the top inch of the soil surface, fertilizing to an appropriate degree.

If access roads were not excavated, the compacted road surface should be harrowed to at least 6 inches in depth, and seeded with appropriate native grass and shrub species by incorporating seed in the top inch of the soil surface, fertilizing to an appropriate degree.

Post-closure weed treatment should be initiated for at least three years after closure, or until native species have re-established as dominant on the site (greater than 50% cover.)
All seeding should occur in late fall (after October 15) or in early spring (before June 1, but not on snowpack.) This will minimize seeding failure through drought.